304001462-100-03-Erosion and Sediment Control Plan-Parklands

Breen Resources Pty Ltd

Prepared for:
Breen Resources Pty Ltd

13 April 2026

Prepared by:
Stantec Australia Pty Ltd

Project/File:
304001462

Stantec Australia Pty Ltd

Revision Schedule

Revision No.	Date	Description	Prepared by	Quality Reviewer	Project Manager Final Approval
A	08/05/2025	50% Draft	GF	JL	GN
B	11/12/2025	Final	GF	JL	GN
C	18/02/2025	Final	GF	JL	GN
D	10/04/2025	Final	GF	JL	GN
E	13/04/2026	Final	GF	JL	GN

Disclaimer

The conclusions in the report are Stantec's professional opinion, as of the time of the report, and concerning the scope described in the report. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. The report relates solely to the specific project for which Stantec was retained and the stated purpose for which the report was prepared. The report is not to be used or relied on for any variation or extension of the project, or for any other project or purpose, and any unauthorized use or reliance is at the recipient's own risk.

Stantec has assumed all information received from the client and third parties in the preparation of the report to be correct. While Stantec has exercised a customary level of judgment or due diligence in the use of such information, Stantec assumes no responsibility for the consequences of any error or omission contained therein.

This report is intended solely for use by the client in accordance with Stantec's contract with the client. While the report may be provided to applicable authorities having jurisdiction and others for whom the client is responsible, Stantec does not warrant the services to any third party. The report may not be relied upon by any other party without the express written consent of Stantec, which may be withheld at Stantec's discretion.

Table of Contents

List of Tables

List of Figures

1 Introduction

A conceptual erosion and sediment control was prepared as part of the Surface Water Management Assessment (Cardno, 2021) prepared to support state significant development (SSD) 10412.

A more detailed erosion and sediment control Managing *Urban Stormwater: Soils and Construction - Volume 1: Blue Book* (Landcom, 2004) (the Bluebook) is required to approximately size sediment basins and flow diversion structures to support the detailed design.

2 Method

2.1 Revised Universal Soil Loss Equation

The Revised Universal Soil Loss Equation (RUSLE) equation is applied to estimate sediment basin sizing in accordance with the Bluebook.

The factors applied to the calculations are summarised in Table 2-1.

Table 2-1 RUSLE equation factor

Factor	Value adopted	Reference
Rainfall erosivity factor	2858	Calculated using 0.5 exceedance per year (EY) 6 hour storm intensity
Soil erodibility factor	0.042	Appendix C of the Blue book
Erosion control practice factor	1.3	Table A2 of Blue book
Ground cover and management factor.	1	Default assumed for stripped topsoil
Soil hydrological group	A – moderate to rapid infiltration rate and low runoff potential	Appendix C of the Blue book
Sediment type	C – Coarse sediment	Appendix C of the Blue book

Temporary diversion structures have been designed to convey the 10% annual exceedance probability event.

2.2 Catchment delineation

Construction sub-catchments have been approximately delineated based on the staging areas to size sediment basins and diversion structures. However, it is noted that the erosion and sediment control plan would be progressively reviewed during construction to ensure structures are adequately sized based on current site topography.

The indicative construction sub-catchments and concept basin locations (shaded blue) are shown in Figure 2-1.

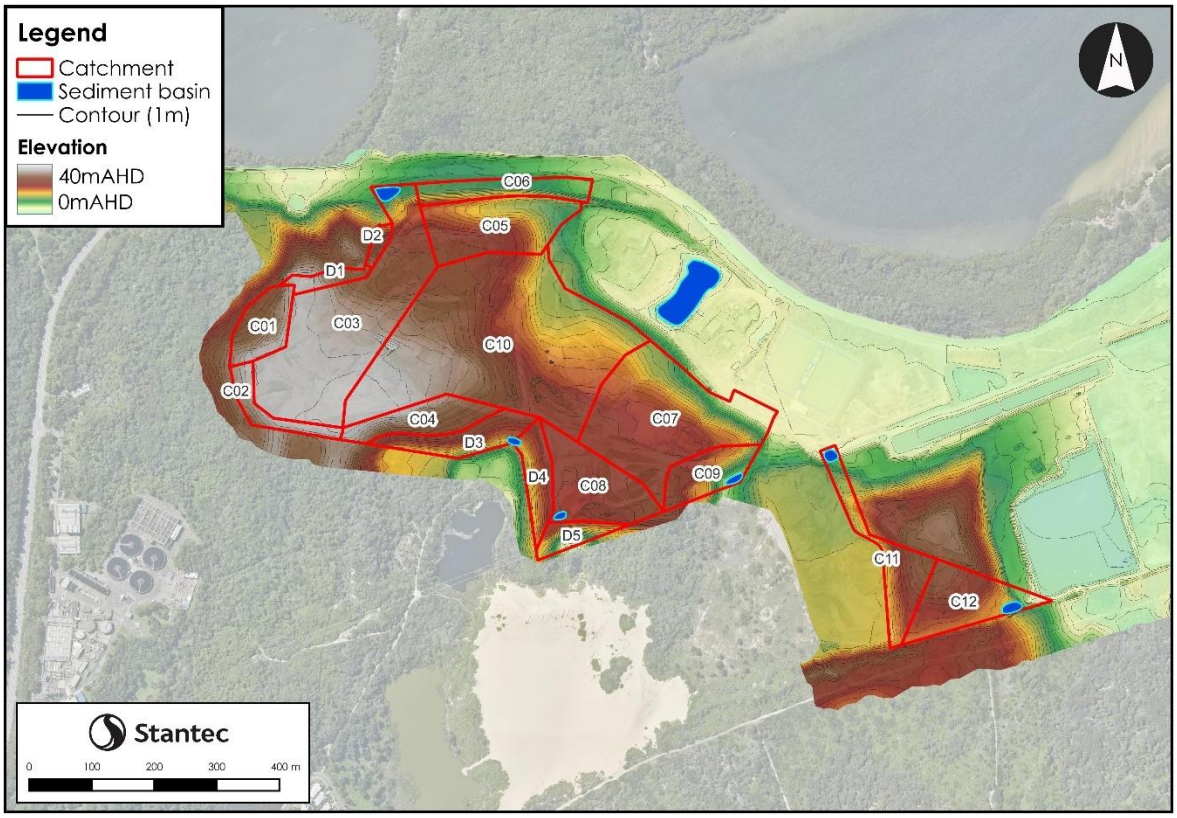


Figure 2-1 Indicative construction sub-catchments

Sediment basin locations and sizes are indicative only to show general location. They will be sized and located in more detail in the civil detailed design documentation.

The catchment areas and details are summarised in Table 2-2. The soil loss class and erosion hazard is also presented in accordance with Table 4.2 of the Blue Book. Catchments generally have a moderate to high erosion hazard due to steep topography across the site.

Table 2-2 Catchment details

Catchment name	Area (ha)	Average slope	Soil loss class	Erosion hazard
C01	0.859	14	1	Very low
C02	0.528	14	1	Very low
C03	4.865	5.5	2	Low
C04	1.009	16	5	High
C05	1.973	13	5	High
C06	0.883	20.5	5	High
C07	3.969	10.5	4	Moderate
C08	1.723	6	3	Low-moderate
C09	0.907	22.5	6	Very high
C10	8.376	9	3	Low-moderate
C11	1.234	19	5	High
C12	1.453	14	5	High
D1	0.298	10.5	4	Moderate
D2	0.151	25.5	6	Very High
D3	0.928	28.5	6	Very high
D4	0.705	24	6	Very high
D5	0.441	39	2	Low (assuming erosion protection)

It is noted that catchments C01, C02 and D5 were assessed assuming a ground cover factor of 0.01 since they will be protected from erosion. This is discussed further in section 3.

3 Erosion and sediment control

3.1 General controls

All catchments are to be developed with standard erosion and sediment (ERSED) controls including:

- Limiting length of slopes to less than 80m
- Install silt fences and diversion drains along all site boundaries
- Apply sound material management practices in relation to the storage and handling. Sound practices include storing materials in designated locations, installing secondary containment bunds, regularly inspecting storage areas and training site personnel in correct practices. Procedures should also be established to clean up any spills correctly and considerate of the appropriate legislation.
- Control discharge of sediment and/or other pollutants from dewatering (site pump-out) activities. Polluted water may need to be treated on-site before being discharged to the stormwater system. Special care is needed where groundwater is or could be contaminated;
- Maintain erosion and sediment control measures until all earthwork activities are completed and the site rehabilitated.
- Audit measures weekly and immediately following rainfall events that cause runoff.
- Discharge from site is not to exceed 50 milligrams per litre of suspended solids in the design rainfall event (the 4EY)
- Construct additional erosion and/or sediment control works as might become necessary to ensure the desired protection is given to downslope lands and waterways, i.e., make ongoing changes to the Plan.
- Staging works to minimise area of exposed soil at one time and progressive stabilisation of exposed areas to establish ground cover.

3.2 Erosion control

For all catchments it is assumed that the ground cover factor will be 1 which is representative of disturbed soil on construction sites.

It was identified following a review of the civil grading that construction of sediment basins C01, C02, and D5 was not feasible. Instead, erosion control will be used to reduce the soil loss and sediment will be controlled with standard erosion controls such as a sediment fence.

The proposed erosion control is a spray on hydromulch product (Figure 3-1). The hydromulch is to be applied to achieve a cover factor of 0.1 in accordance Table A3 of the Blue Book.

Figure 3-1 Hydromulch application (Catchments & Creeks Pty Ltd, 2010)

An accepted standard for hydromulching is the *Light mulching* fact sheet (Catchments & Creeks Pty Ltd, 2010). The following applies:

1. **Mulch specification**
    a. to the maximum degree practical the mulch shall be free of weed species especially prohibited noxious weed seed. Do not use woody or other heavy materials than may interfere with the emergence of seedlings.
2. **Application (General)**
    a. Refer to approved plans for location, extent, and application details. If there are questions or problems with the location, extent, or method of application contact the engineer or responsible on-site officer for assistance.
    b. Ensure the surface is free of deep track marks of other features that may result in flow concentration down the slope. Where necessary, establish up-slope drainage controls to limit run-on water that may disturb the mulch.

c. Spread enough mulch to completely cover the surface of the soil at the density or thickness specified in the approved plans, but not greater than 50mm.
d. Machine applications shall comprise a minimum of two passes in opposite directions unless otherwise specified.
e. During application, all reasonable efforts shall be taken to avoid spray onto roads, pathways, drainage channels not intended for application, and existing vegetation.
f. Suitable anchorage of the mulch must be accomplished immediately after the mulch has been placed.
g. Ensure the mulch is restrained from excessive movement by wind or stormwater runoff by the appropriately application of an approved tackifier. On flat or gentle slopes, straw mulch may be fixed to the soil by mechanical crimping.
h. If the treated area was seeded, continue to water after mulching in accordance with weather conditions, or as required to obtain suitable germination and plant establishment.
i. Application (spraying) of a tackifier must not be performed during periods of windy conditions that would prevent the proper placement of adhesive.
j. The contractor must take appropriate steps to protect all traffic, signs, structures, and other objects from being marked or disfigured by the tackifier material.

3. **Application (hydromulching)**
   a. Refer to approved plans for location, extent, and application details. If there are questions or problems with the location, extent, or method of application contact the engineer or responsible on-site officer for assistance.
   b. Ensure the surface is free of deep track marks of other features that may result in flow concentration down the slope. Where necessary, establish up-slope drainage controls to limit run-on water that may disturb the mulch.
   c. Prior to application, roughen the soil surface and fill areas by rolling with a crimping or punching type roller, or by track walking where practical.
   d. If the soil is dry, water the treatment area before hydroseeding to increase penetration of the adhesive and fertiliser additives.
   e. Add straw, wood or paper cellulose fibre mulch to the slurry at the specified rate, otherwise at a rate of 2 to 3 tonnes per hectare.
   f. Machine applications shall comprise a minimum of two passes in opposite directions unless otherwise specified.
   g. During application, all reasonable efforts shall be taken to avoid spray onto roads, pathways, drainage channels not intended for application, and existing vegetation.
   h. The contractor must take appropriate steps to protect all traffic, signs, structures, and other objects from being marked or disfigured by the mulch and/or associated tackifier.
   i. Continue to water after allowing 24 hours drying time. Water in accordance with the weather conditions, or as required to maintain suitable germination and plant growth. The wood-fibre should be kept moist until germination occurs.

4. **Maintenance**
   a. Inspect all mulches fortnightly and after runoff-producing rainfall and strong winds.
   b. Check for rill erosion, or dislodgment of the mulch.
   c. Replace any displaced mulch to maintain the required coverage.
   d. If stormwater runoff displaces more than 10% of the mulch, then investigate the need for additional drainage controls to prevent further displacement.
   e. Continue inspections until vegetation is suitably established or erosion control is no longer required.
   f. If the mulching is not effective in containing the soil erosion it should be replaced, or an alternative erosion control procedure adopted.

3.3 General site drainage

3.3.1 Flow diversion structures

For all catchments high flow diversion structures (Figure 3-2) are required to divert water to the sediment basins and should be sized to safely convey the 10% AEP. The cross sectional area of flow diversion structures required to safely convey the 10% AEP at a velocity of 0.5 m/s are summarised in Table 3-1.

Table 3-1 10% AEP flowrate calculation

Catchment name	Catchment Area (ha)	Time of concentration (tc)	10% AEP, 15 minute rainfall intensity (mm/hour)	C10 runoff coefficient	10% AEP, 15-minute duration flowrate (m3/s)
C01	0.859	15	108	0.75	0.193
C02	0.528	15	108	0.75	0.119
C03	4.865	15	108	0.75	1.096
C04	1.009	15	108	0.75	0.227
C05	1.973	15	108	0.75	0.444
C06	0.883	15	108	0.75	0.199
C07	3.969	15	108	0.75	0.894
C08	1.723	15	108	0.75	0.388
C09	0.907	15	108	0.75	0.204
C10	8.376	15	108	0.75	1.886
C11	1.234	15	108	0.75	0.278
C12	1.453	15	108	0.75	0.327
D1	0.298	15	108	0.75	0.067
D2	0.151	15	108	0.75	0.034
D3	0.928	15	108	0.75	0.209
D4	0.705	15	108	0.75	0.159
D5	0.441	15	108	0.75	0.099

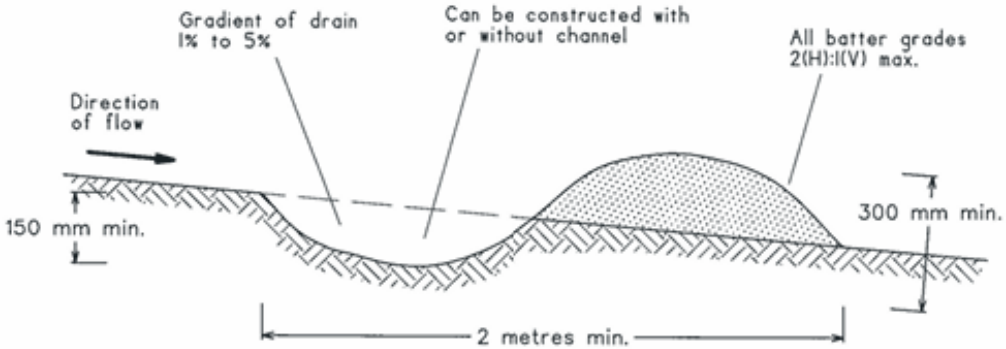
Approximate sizing of diversion drains is provided as Table 3-2.

Table 3-2 Diversion drain sizing

Name	Associated sub catchments	10% AEP, 15-minute duration flowrate (m^3/s)	Allowable velocity (m/s)	Cross sectional area (m^2)
DD3	C03	1.096	0.5	2.192
DD3/4	C04, D3	0.436	0.5	0.872
DD4	D4	0.159	0.5	0.318
DD5	C05	0.444	0.5	0.888
DD6	C06	0.199	0.5	0.398
DD5/6	C05, C06	0.643	0.5	1.286
DD7	C07	0.894	0.5	1.788

Name	Associated sub catchments	10% AEP, 15-minute duration flowrate (m^3/s)	Allowable velocity (m/s)	Cross sectional area (m^2)
DD8A	C08	0.194	0.5	0.388
DD8B	C08	0.194	0.5	0.388
DD9A	C09	0.061	0.5	0.122
DD9B	C09	0.143	0.5	0.286
DD10	C10	1.886	0.5	3.772
DD11	C11	0.278	0.5	0.556
DD12	C12	0.327	0.5	0.654

Low flow diversions (Figure 3-2) can be used where needed to ensure catchment slopes do not exceed 80m in length.



NOTE: Only to be used as temporary bank where maximum upslope length is 80 metres.

Construction Notes

1. Build with gradients between 1 percent and 5 percent.
2. Avoid removing trees and shrubs if possible - work around them.
3. Ensure the structures are free of projections or other irregularities that could impede water flow.
4. Build the drains with circular, parabolic or trapezoidal cross sections, not V shaped.
5. Ensure the banks are properly compacted to prevent failure.
6. Complete permanent or temporary stabilisation within 10 days of construction.

EARTH BANK (LOW FLOW) **SD 5-5**

Figure 3-2 Low flow typical detail

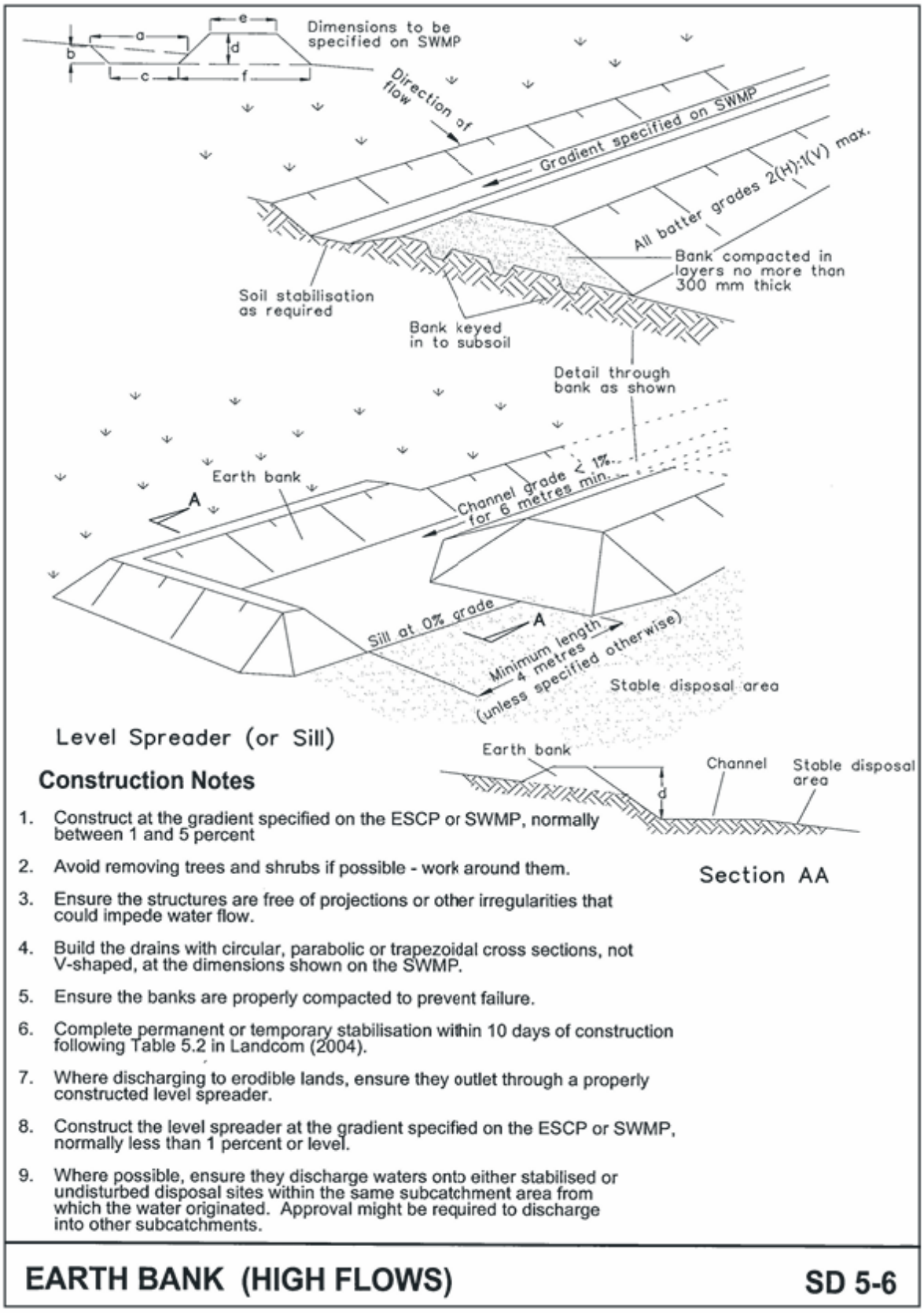


Figure 3-3 High flow typical detail

3.3.1.1 Rock check dams

Longitudinal grade of unlined diversion drains is recommended to be flatter than 10%. Rock check dams are to be implemented to maintain velocities below 0.5m/s in the proposed diversion drains when longitudinal grades are less than 10%.

A suitable lining is recommended where diversion drain grades are steeper than 10% to reduce erosion of soils in the drain, and if erosion is observed along the diversion drains at the site following rainfall events.

See Figure 3-4 for the typical rock check dam detail. Check dams are to be adequately spaced to ensure headwater aligns with the toe of the upstream check dam.

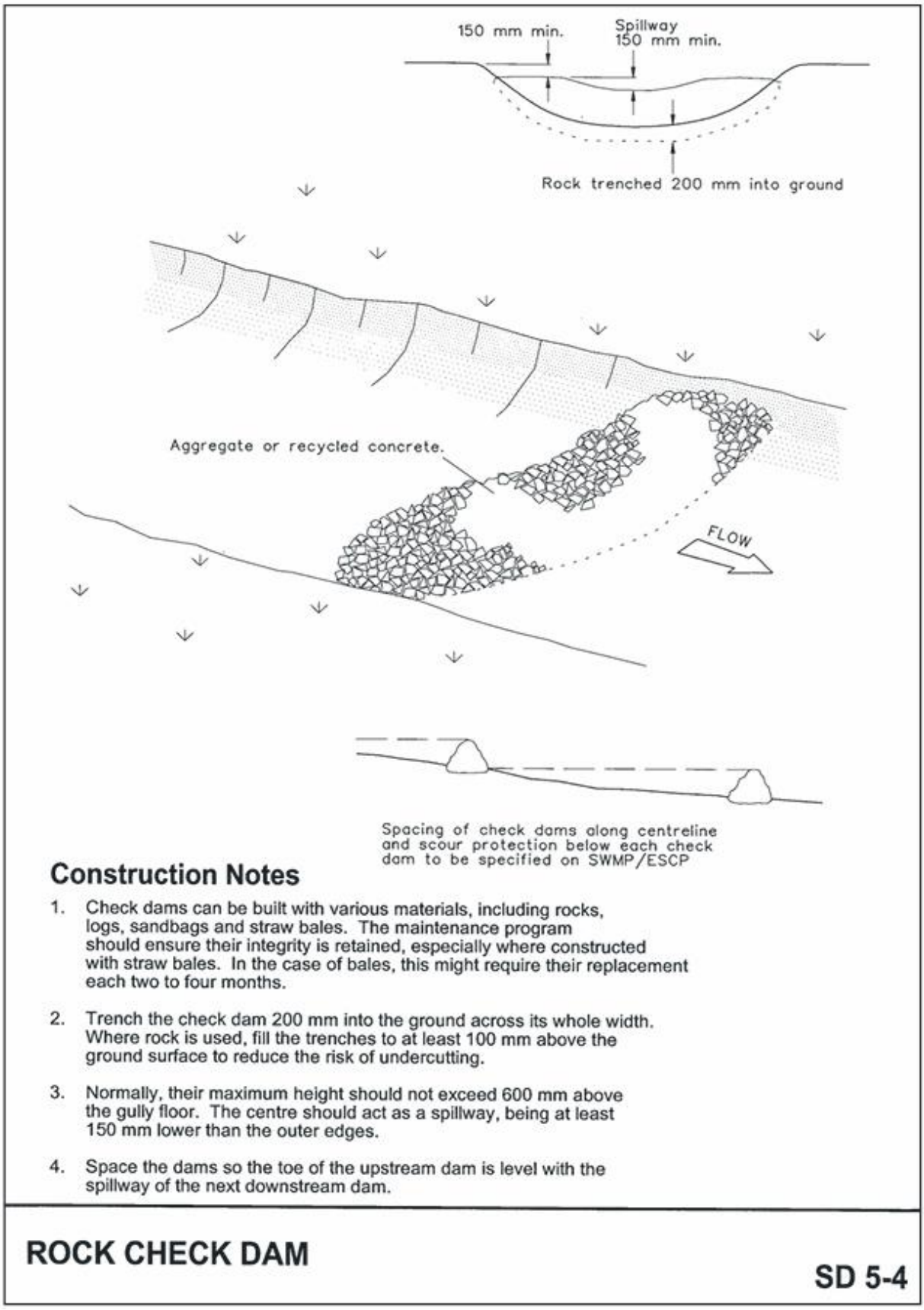


Figure 3-4 Rock check dam detail

3.4 Sediment control

3.4.1 Sediment fences

Sediment fences are to be installed downslope of all catchments along the bottom contour. The typical sediment fence detail is shown as Figure 3-5. The layout and detail of sediment fences will be confirmed following detailed civil design of the site.

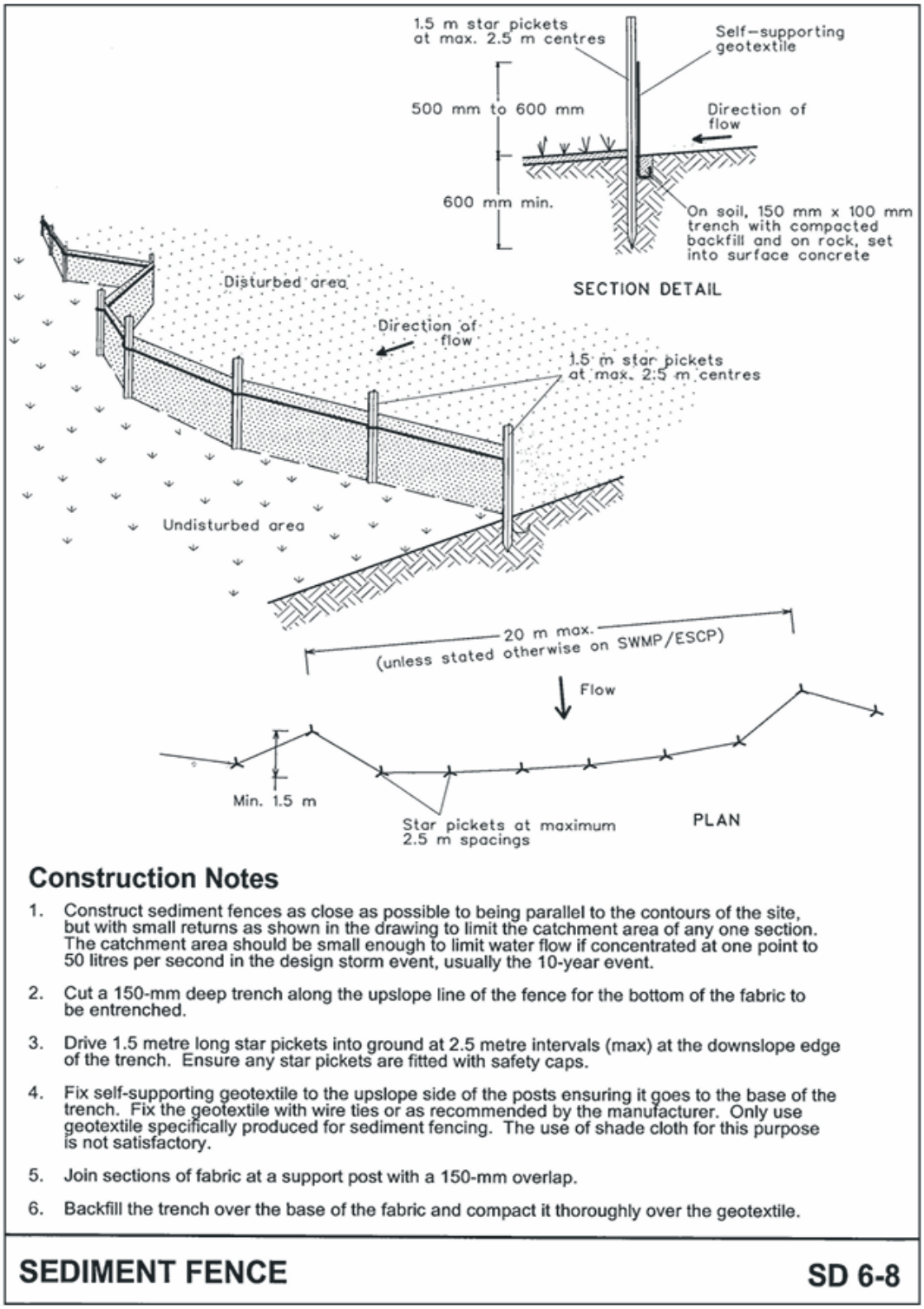


Figure 3-5 Sediment fence detail

3.4.2 Sediment basin sizing

Sediment basins and diversion structures were sized for each catchment (except D1, D2, D5, C01 and C02) in accordance with the Blue Book. A typical section for the basin type is shown as Figure 3-6.

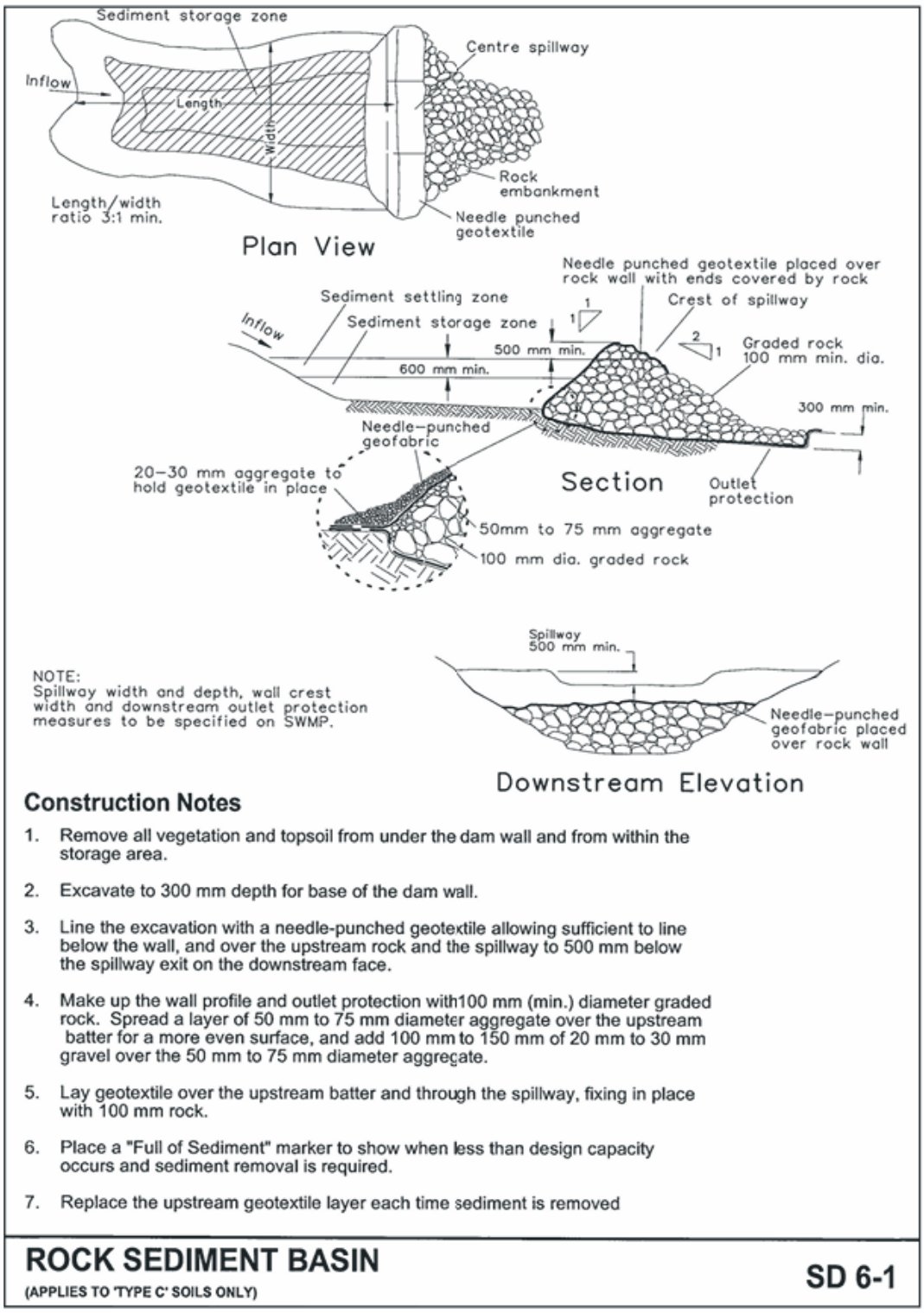


Figure 3-6 Type C sediment basin

The indicative sizing of the sediment basins to capture soil loss and the 4EY are summarised in Table 3-3.

Table 3-3 Sediment basin sizing

Name	D3	D4	C03	C04	C05	C06	C07	C08	C09	C10	C11	C12
Catchment Area (ha)	0.151	0.928	4.865	1.009	1.973	0.883	3.969	1.723	0.907	8.376	1.234	1.453
Sediment type	C	C	C	C	C	C	C	C	C	C	C	C
Design rainfall event	4EY	4EY	4EY	4EY	4EY	4EY	4EY	4EY	4EY	4EY	4EY	4EY
Flowrate (m^3/s)	0.002	0.015	0.077	0.016	0.031	0.014	0.063	0.027	0.014	0.133	0.02	0.023
Area Factor	4100	4100	4100	4100	4100	4100	4100	4100	4100	4100	4100	4100
Settling (water) depth (m)	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Basin Surface Area (m^2)	61.5	45.1	315.7	65.6	127.1	57.4	258.3	110.7	57.4	545.3	82	94.3
Settling (water) volume (m^3)	36.9	27.1	189.4	39.4	76.3	34.4	155	66.4	34.4	327.2	49.2	56.6
Storage (soil) volume (m^3)	176.6	90.7	131.8	91.8	167.3	72.3	245.3	51.7	156	275.4	102.5	136.6
Total basin volume (m^3)	213.5	117.8	321.2	131.2	243.6	106.7	400.3	118.1	190.4	602.6	151.7	193.2
Basin Length: width ratio	3	3	3	3	3	3	3	3	3	3	3	3
Basin Length (m)	3	3	30.8	14	19.5	13.1	27.8	18.2	13.1	40.4	15.7	16.8
Basin Width (m)	13.6	11.6	10.3	4.7	6.5	4.4	9.3	6.1	4.4	13.5	5.2	5.6
Spillway Flowrate (m^3/s)	4.5	3.9	0.54	0.112	0.219	0.098	0.441	0.191	0.101	0.93	0.137	0.161

Emergency spillways should be designed to safely convey the 10% AEP flowrates. The layout and detail of sediment basins will be confirmed following detailed civil design of the site.

Sediment basins are not required to be constructed for catchments C05, C06, C07 and C10. These catchments will outlet into the existing sediment basin which is shown as Figure 3-7. This basin has been recently surveyed by Breen and has an estimated volume of 24,507m^3 available. This volume is well in exceedance of the collective 4EY volume requirements of catchments C05, C06, C07 and C10 (~1353m^3).

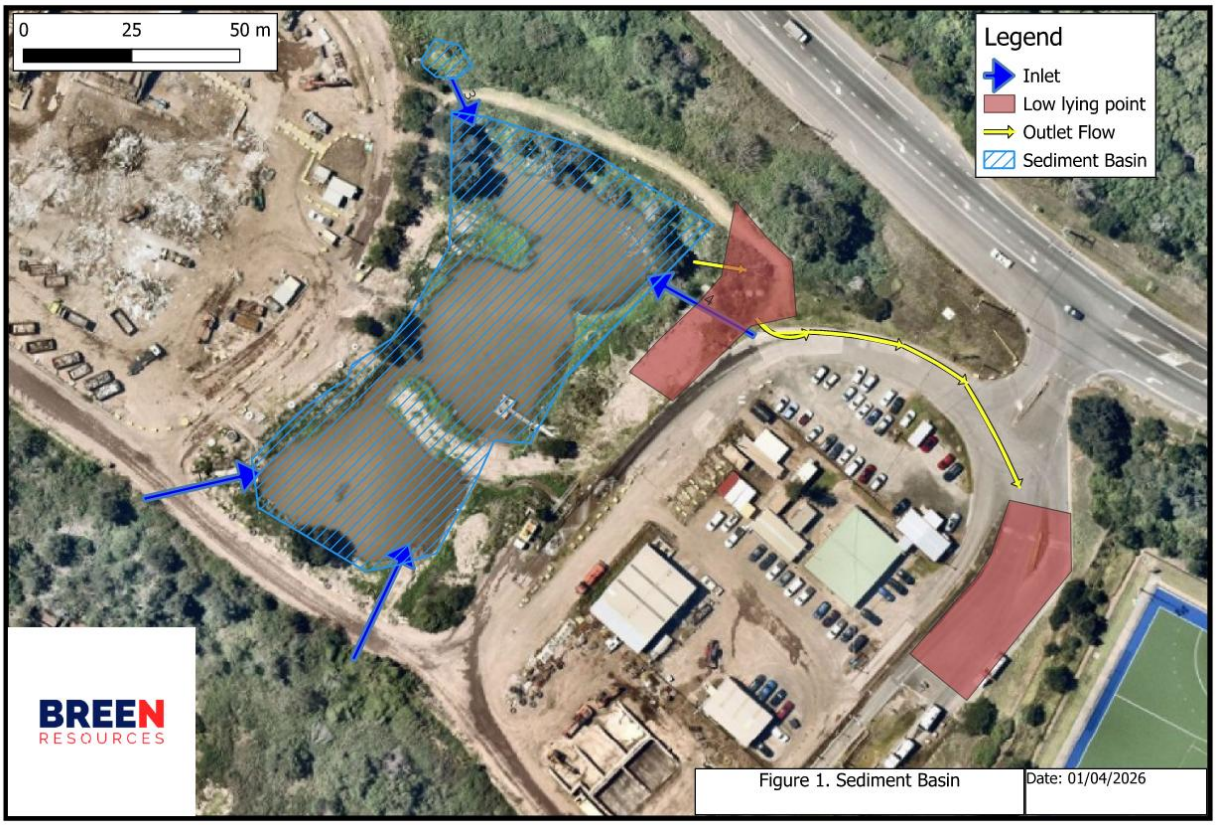


Figure 3-7 Existing sediment basin arrangement

Catchments C04, D3 and D4 outlet in the approximate location of a permanent on-site detention basin (OSD) which is sized to attenuate flows from the proposed parklands car parking. The location of the basin is shown upstream of measurement point four (4) in Figure 3-8.

The future OSD basin is sized with a volume of 818m^3, this volume exceeds the collective storage requirement of a sediment basin for catchments C04, D3 and D4 (463m^3). Therefore, the OSD basin area will be used for the temporary sediment basin.

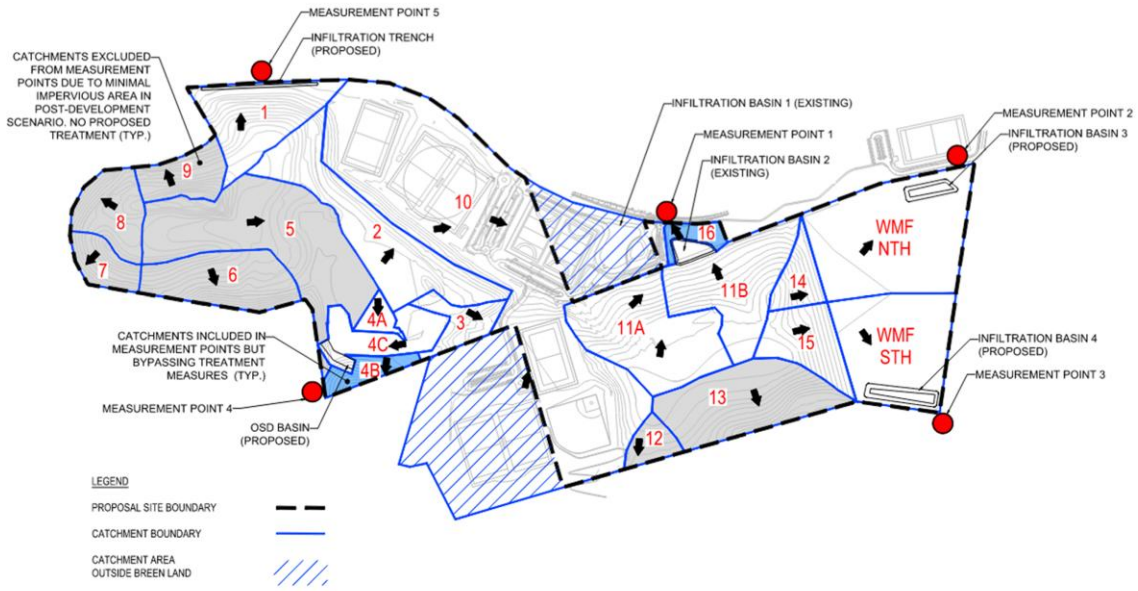


*Figure 3-8 Post-development surface water management strategy (source: Kurnell Resource Recovery Facility EIS - Surface Water Management Assessment (*Cardno, 2021)

3.5 ERSED plan overview

The proposed erosion and sediment control features to be adopted at the site are provided as Figure 3-9 and Figure 3-10. It is noted that the location of the sediment basins and diversion drains is subject to detailed civil design, and may be optimised to best align with operational conditions at the site.

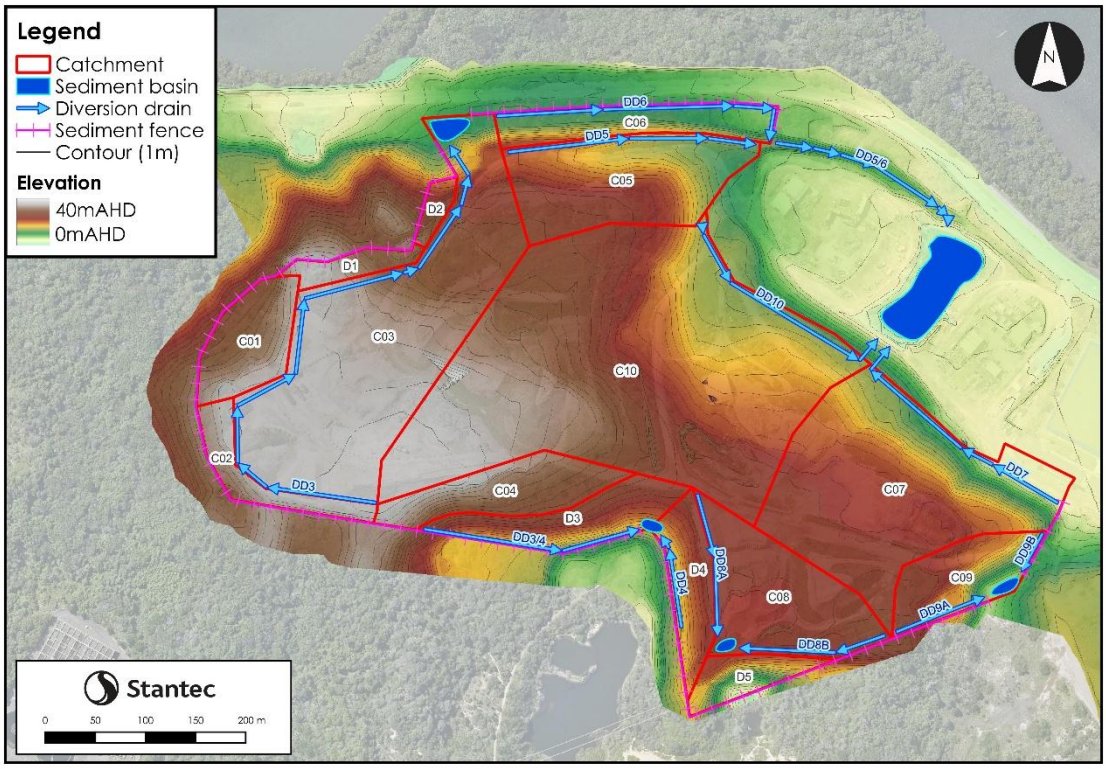


Figure 3-9 Erosion and sediment controls overview

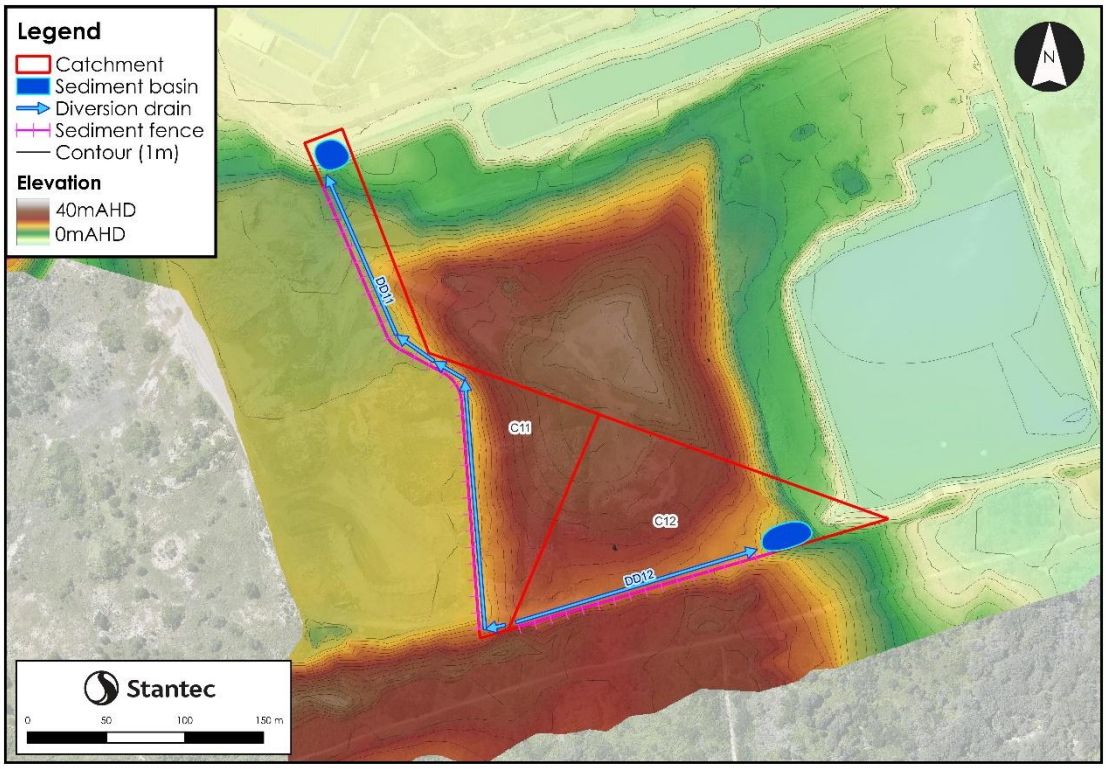


Figure 3-10 Erosion and sediment controls overview

4 Conclusions and Recommendations

In conclusion, indicative sediment basins and flow diversion structures have been sized in accordance with the Blue Book.

The sizing is indicative and may change during construction stages, and it is the responsibility of the contractor to confirm erosion controls are adequately sized and positioned based on the construction site conditions.

The calculation spreadsheet is provided as Appendix A and is to be issued to the contractor for use in stage specific erosion control plans. RUSLE calculation factors should be retained, however catchment areas, slope, cover factors and safe velocity of diversion structures can be changed to represent staged construction sub catchment conditions or proposed controls.

5 References

Catchments & Creeks Pty Ltd. (2010). *Light mulching*. Retrieved from https://catchmentsandcreeks.com.au/fact-sheet/light-mulching/

Landcom. (2004). *Managing Urban Stormwater: Soils and Construction* (4th ed.).

Appendix A Calculations

1. Erosion Hazard and Sediment Basins

Site Name: Breen Resources (Parklands)

Site Location: 330 Captain Cook Drive, Kurnell NSW 2231

Precinct/Stage: Parklands

Other Details: Calculations for "304001462-100-03-Erosion and Sediment Control Plan-Parklands" (Stantec, 2026)

Site area	Sub-catchment or Name of Structure						Notes
	C01	C02	C03	C04	C05	C06	
Total catchment area (ha)	0.859	0.528	4.865	1.009	1.973	0.883	
Disturbed catchment area (ha)	0.859	0.528	4.865	1.009	1.973	0.883	

Soil analysis (enter sediment type if known, or laboratory particle size data)

Sediment Type (C, F or D) if known:	C	C	C	C	C	C	From Appendix C (if known)
% sand (fraction 0.02 to 2.00 mm)							Enter the percentage of each soil fraction. E.g. enter 10 for 10%
% silt (fraction 0.002 to 0.02 mm)							
% clay (fraction finer than 0.002 mm)							
Dispersion percentage							E.g. enter 10 for dispersion of 10%
% of whole soil dispersible							See Section 6.3.3(e). Auto-calculated
Soil Texture Group	C	C	C	C	C	C	Automatic calculation from above

Rainfall data

Design rainfall depth (no of days)							See Section 6.3.4 and, particularly, Table 6.3 on pages 6-24 and 6-25.
Design rainfall depth (percentile)							
x-day, y-percentile rainfall event (mm)							
Rainfall R-factor (if known)	2858	2858	2858	2858	2858	2858	Only need to enter one or the other here
IFD: 2-year, 6-hour storm (if known)							

RUSLE Factors

Rainfall erosivity (*R*-factor)	2858	2858	2858	2858	2858	2858	Auto-filled from above
Soil erodibility (*K*-factor)	0.042	0.042	0.042	0.042	0.042	0.042	
Slope length (m)	80	40	80	60	80	35	
Slope gradient (%)	14	14	5.5	16	13	20.5	RUSLE LS factor calculated for a high rill/interrill ratio.
Length/gradient (*LS*-factor)	4.61	2.79	1.33	4.46	4.15	4.01	
Erosion control practice (*P*-factor)	1.3	1.3	1.3	1.3	1.3	1.3	
Ground cover (*C*-factor)	0.1	0.1	1	1	1	1	

Sediment Basin Design Criteria (for Type D/F basins only. Leave blank for Type C basins)

Storage (soil) zone design (no of months)							Minimum is generally 2 months
Cv (Volumetric runoff coefficient)							See Table F2, page F-4 in Appendix F

Calculations and Type D/F Sediment Basin Volumes

Soil loss (t/ha/yr)	72	44	207	696	648	626	
Soil Loss Class	1	1	2	5	5	5	See Table 4.2, page 4-13
Is a sediment basin required?	No	No	Yes	Yes	Yes	Yes	Clause 6.3.2 (d), using 200 t/yr limit
Soil loss (m^3/ha/yr)	55	33	159	535	499	482	Conversion to cubic metres
Sediment basin storage (soil) volume (m^3)							See Sections 6.3.4(i) for calculations
Sediment basin settling (water) volume (m^3)							See Sections 6.3.4(i) for calculations
Sediment basin total volume (m^3)							

NB for sizing of Type C (coarse) sediment basins, see Worksheet 3 (if required).

1. Erosion Hazard and Sediment Basins

Site Name: Breen Recources (Parklands)

Site Location: 330 Captain Cook Drive, Kurnell NSW 2231

Precinct/Stage: Parklands

Other Details: Calculations for "304001462-100-03-Erosion and Sediment Control Plan-Parklands" (Stantec, 2026)

Site area	Sub-catchment or Name of Structure						Notes
	C07	C08	C09	C10	C11	C12	
Total catchment area (ha)	3.969	1.723	0.907	8.376	1.234	1.453	
Disturbed catchment area (ha)	3.969	1.723	0.907	8.376	1.234	1.453	

Soil analysis (enter sediment type if known, or laboratory particle size data)

Sediment Type (C, F or D) if known:	C	C	C	C	C	C	From Appendix C (if known)
% sand (fraction 0.02 to 2.00 mm)							Enter the percentage of each soil fraction. E.g. enter 10 for 10%
% silt (fraction 0.002 to 0.02 mm)							
% clay (fraction finer than 0.002 mm)							
Dispersion percentage							E.g. enter 10 for dispersion of 10%
% of whole soil dispersible							See Section 6.3.3(e). Auto-calculated
Soil Texture Group	C	C	C	C	C	C	Automatic calculation from above

Rainfall data

Design rainfall depth (no of days)							See Section 6.3.4 and, particularly, Table 6.3 on pages 6-24 and 6-25.
Design rainfall depth (percentile)							
x-day, y-percentile rainfall event (mm)							
Rainfall R-factor (if known)	2858	2858	2858	2858	2858	2858	Only need to enter one or the other here
IFD: 2-year, 6-hour storm (if known)							

RUSLE Factors

Rainfall erosivity (*R*-factor)	2858	2858	2858	2858	2858	2858	Auto-filled from above
Soil erodibility (*K*-factor)	0.042	0.042	0.042	0.042	0.042	0.042	RUSLE LS factor calculated for a high rill/interrill ratio.
Slope length (m)	80	80	80	45	40	80	
Slope gradient (%)	10.5	6	22.5	9	19	14	
Length/gradient (*LS*-factor)	3.03	1.47	8.43	1.61	4.07	4.61	
Erosion control practice (*P*-factor)	1.3	1.3	1.3	1.3	1.3	1.3	
Ground cover (*C*-factor)	1	1	1	1	1	1	

Sediment Basin Design Criteria (for Type D/F basins only. Leave blank for Type C basins)

Storage (soil) zone design (no of months)							Minimum is generally 2 months
Cv (Volumetric runoff coefficient)							See Table F2, page F-4 in Appendix F

Calculations and Type D/F Sediment Basin Volumes

Soil loss (t/ha/yr)	473	229	1315	251	635	719	
Soil Loss Class	4	3	6	3	5	5	See Table 4.2, page 4-13
Is a sediment basin required?	Yes	Yes	Yes	Yes	Yes	Yes	Clause 6.3.2 (d), using 200 t/yr limit
Soil loss (m^3/ha/yr)	364	176	1012	193	488	553	Conversion to cubic metres
Sediment basin storage (soil) volume (m^3)							See Sections 6.3.4(i) for calculations
Sediment basin settling (water) volume (m^3)							See Sections 6.3.4(i) for calculations
Sediment basin total volume (m^3)							

NB for sizing of Type C (coarse) sediment basins, see Worksheet 3 (if required).

1. Erosion Hazard and Sediment Basins

Site Name: Breen Resources (Parklands)

Site Location: 330 Captain Cook Drive, Kurnell NSW 2231

Precinct/Stage: Parklands

Other Details: Calculations for "304001462-100-03-Erosion and Sediment Control Plan-Parklands" (Stantec, 2026)

Site area	Sub-catchment or Name of Structure						Notes
	D1	D2	D3	D4	D5		
Total catchment area (ha)	0.298	0.151	0.928	0.705	0.441		
Disturbed catchment area (ha)	0.298	0.151	0.928	0.705	0.441		

Soil analysis (enter sediment type if known, or laboratory particle size data)

Sediment Type (C, F or D) if known:	C	C	C	C	C		From Appendix C (if known)
% sand (fraction 0.02 to 2.00 mm)							Enter the percentage of each soil fraction. E.g. enter 10 for 10%
% silt (fraction 0.002 to 0.02 mm)							
% clay (fraction finer than 0.002 mm)							
Dispersion percentage							E.g. enter 10 for dispersion of 10%
% of whole soil dispersible							See Section 6.3.3(e). Auto-calculated
Soil Texture Group	C	C	C	C	C		Automatic calculation from above

Rainfall data

Design rainfall depth (no of days)							See Section 6.3.4 and, particularly, Table 6.3 on pages 6-24 and 6-25.
Design rainfall depth (percentile)							
x-day, y-percentile rainfall event (mm)							
Rainfall R-factor (if known)	2858	2858	2858	2858	2858		Only need to enter one or the other here
IFD: 2-year, 6-hour storm (if known)							

RUSLE Factors

Rainfall erosivity (*R*-factor)	2858	2858	2858	2858	2858		Auto-filled from above
Soil erodibility (*K*-factor)	0.042	0.042	0.042	0.042	0.042		RUSLE LS factor calculated for a high rill/interrill ratio.
Slope length (m)	80	50	65	50	60		
Slope gradient (%)	10.5	25.5	28.5	24	39		
Length/gradient (*LS*-factor)	3.03	6.74	9.32	6.30	11.88		
Erosion control practice (*P*-factor)	1.3	1.3	1.3	1.3	1.3		
Ground cover (*C*-factor)	1	1	1	1	0.1		

Sediment Basin Design Criteria (for Type D/F basins only. Leave blank for Type C basins)

Storage (soil) zone design (no of months)							Minimum is generally 2 months
Cv (Volumetric runoff coefficient)							See Table F2, page F-4 in Appendix F

Calculations and Type D/F Sediment Basin Volumes

Soil loss (t/ha/yr)	473	1051	1455	984	185		
Soil Loss Class	4	6	6	6	2		See Table 4.2, page 4-13
Is a sediment basin required?	No	No	Yes	Yes	No		Clause 6.3.2 (d), using 200 t/yr limit
Soil loss (m^3/ha/yr)	364	809	1119	757	143		Conversion to cubic metres
Sediment basin storage (soil) volume (m^3)							See Sections 6.3.4(i) for calculations
Sediment basin settling (water) volume (m^3)							See Sections 6.3.4(i) for calculations
Sediment basin total volume (m^3)							

NB for sizing of Type C (coarse) sediment basins, see Worksheet 3 (if required).

2. Flow Calculations

Peak flow is given by the Rational Formula: $Qy = 0.00278 \times C_{10} \times F_Y \times I_{y,\,tc} \times A$

where:
- Q_y is peak flow rate (m^3/sec) of average recurrence interval (ARI) of "Y" years
- C_{10} is the runoff coefficient (dimensionless) for ARI of 10 years
- F_y is a frequency factor for "Y" years.
- A is the catchment area in hectares (ha
- $I_{y,\,tc}$ is the average rainfall intensity (mm/hr) for an ARI of "Y" years and a design duration of "tc" (minutes or hours)

Time of concentration (t_c) = $0.76 \times (A/100)^{0.38}$ hrs

Note: For urban catchments or construction sites the time of concentration should be reduced by a factor of 50 per cent if the catchment is 10ha or larger. Place an x in the appropriate row below to automatically halve the time of concentration for that sub-catchment.

Structure Details									Notes
Name	C01	C02	C03	C04	C05	C06			
Catchment Area (ha)	0.859	0.528	4.865	1.009	1.973	0.883			
Place an x here to halve tc									x for urban catchment ≥10ha
Time of concentration (tc)	7	6	14	8	10	8			minutes

Rainfall Intensities

1-year, tc	38.6	38.6	38.6	38.6	38.6	38.6			Enter the relevant rainfall intensities (in mm/hr) for each of the nominated rainfall events. The time of concentration (tc) determines the duration of the event to be used
2-year, tc	78.4	78.4	78.4	78.4	78.4	78.4			
5-year, tc	92.7	92.7	92.7	92.7	92.7	92.7			
10-year, tc	108	108	108	108	108	108			
20-year, tc	122	122	122	122	122	122			
50-year, tc	141	141	141	141	141	141			
100-year, tc	155	155	155	155	155	155			

C10 runoff coefficient	0.75	0.75	0.75	0.75	0.75	0.75			Use AR&R or Table F3, pg F-6

Frequency Factors

FF, 1-year	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	Can use 0.8 for a construction site
FF, 2-year	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	Can use 0.85 for a construction site
FF, 5-year	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	Can use 0.95 for a construction site
FF, 10-year	1	1	1	1	1	1	1	1	Generally always 1
FF, 20-year	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	Can use 1.05 for a construction site
FF, 50-year	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	Can use 1.15 for a construction site
FF, 100-year	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	Can use 1.2 for a construction site

Flow Calculations									Notes
1-year, tc (m^3/s)	0.055	0.034	0.313	0.065	0.127	0.057			
2-year, tc (m^3/s)	0.119	0.073	0.676	0.14	0.274	0.123			
5-year, tc (m^3/s)	0.158	0.097	0.893	0.185	0.362	0.162			
10-year, tc (m^3/s)	0.193	0.119	1.096	0.227	0.444	0.199			
20-year, tc (m^3/s)	0.229	0.141	1.299	0.269	0.527	0.236			
50-year, tc (m^3/s)	0.29	0.179	1.645	0.341	0.667	0.299			
100-year, tc (m^3/s)	0.333	0.205	1.887	0.391	0.765	0.342			

NB for flow calculations on sediment basin spillways, see Worksheet 3 (if required).

2. Flow Calculations

Peak flow is given by the Rational Formula: $Qy = 0.00278 \times C_{10} \times F_Y \times I_{y,\,tc} \times A$

where:
- Q_y is peak flow rate (m^3/sec) of average recurrence interval (ARI) of "Y" years
- C_{10} is the runoff coefficient (dimensionless) for ARI of 10 years.
- F_y is a frequency factor for "Y" years.
- A is the catchment area in hectares (ha)
- $I_{y,\,tc}$ is the average rainfall intensity (mm/hr) for an ARI of "Y" years and a design duration of "tc" (minutes or hours)

Time of concentration (t_c) = $0.76 \times (A/100)^{0.38}$ hrs

Note: For urban catchments or construction sites the time of concentration should be reduced by a factor of 50 per cent if the catchment is 10ha or larger. Place an x in the appropriate row below to automatically halve the time of concentration for that sub-catchment.

Structure Details									Notes
Name	C07	C08	C09	C10	C11	C12			
Catchment Area (ha)	3.969	1.723	0.907	8.376	1.234	1.453			
Place an x here to halve tc									x for urban catchment ≥10ha
Time of concentration (tc)	13	10	8	18	9	9			minutes

Rainfall Intensities

1-year, tc	38.6	38.6	38.6	38.6	38.6	38.6			Enter the relevant rainfall intensities (in mm/hr) for each of the nominated rainfall events. The time of concentration (tc) determines the duration of the event to be used
2-year, tc	78.4	78.4	78.4	78.4	78.4	78.4			
5-year, tc	92.7	92.7	92.7	92.7	92.7	92.7			
10-year, tc	108	108	108	108	108	108			
20-year, tc	122	122	122	122	122	122			
50-year, tc	141	141	141	141	141	141			
100-year, tc	155	155	155	155	155	155			

C10 runoff coefficient	0.75	0.75	0.75	0.75	0.75	0.75			Use AR&R or Table F3, pg F-6

Frequency Factors

FF, 1-year	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	Can use 0.8 for a construction site
FF, 2-year	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	Can use 0.85 for a construction
FF, 5-year	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	Can use 0.95 for a construction
FF, 10-year	1	1	1	1	1	1	1	1	Generally always 1
FF, 20-year	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	Can use 1.05 for a construction
FF, 50-year	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	Can use 1.15 for a construction
FF, 100-year	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	Can use 1.2 for a construction site

Flow Calculations									Notes
1-year, tc (m^3/s)	0.256	0.111	0.058	0.539	0.079	0.094			
2-year, tc (m^3/s)	0.551	0.239	0.126	1.164	0.171	0.202			
5-year, tc (m^3/s)	0.729	0.316	0.167	1.538	0.227	0.267			
10-year, tc (m^3/s)	0.894	0.388	0.204	1.886	0.278	0.327			
20-year, tc (m^3/s)	1.06	0.46	0.242	2.237	0.33	0.388			
50-year, tc (m^3/s)	1.342	0.583	0.307	2.832	0.417	0.491			
100-year, tc (m^3/s)	1.539	0.668	0.352	3.248	0.479	0.563			

NB for flow calculations on sediment basin spillways, see Worksheet 3 (if required).

2. Flow Calculations

Peak flow is given by the Rational Formula: $Qy = 0.00278 \times C_{10} \times F_Y \times I_{y,\,tc} \times A$

where:
- Q_y is peak flow rate (m^3/sec) of average recurrence interval (ARI) of "Y" years
- C_{10} is the runoff coefficient (dimensionless) for ARI of 10 years.
- F_y is a frequency factor for "Y" years.
- A is the catchment area in hectares (ha)
- $I_{y,\,tc}$ is the average rainfall intensity (mm/hr) for an ARI of "Y" years and a design duration of "tc" (minutes or hours)

Time of concentration (t_c) = $0.76 \times (A/100)^{0.38}$ hrs

Note: For urban catchments or construction sites the time of concentration should be reduced by a factor of 50 per cent if the catchment is 10ha or larger. Place an x in the appropriate row below to automatically halve the time of concentration for that sub-catchment.

Structure Details									Notes
Name	D1	D2	D3	D4	D5				
Catchment Area (ha)	0.298	0.151	0.928	0.705	0.441				
Place an x here to halve tc									x for urban catchment ≥10ha
Time of concentration (tc)	5	4	8	7	6				minutes

Rainfall Intensities

1-year, tc	38.6	38.6	38.6	38.6	38.6	38.6			Enter the relevant rainfall intensities (in mm/hr) for each of the nominated rainfall events. The time of concentration (tc) determines the duration of the event to be used
2-year, tc	78.4	78.4	78.4	78.4	78.4	78.4			
5-year, tc	92.7	92.7	92.7	92.7	92.7	92.7			
10-year, tc	108	108	108	108	108	108			
20-year, tc	122	122	122	122	122	122			
50-year, tc	141	141	141	141	141	141			
100-year, tc	155	155	155	155	155	155			

C10 runoff coefficient	0.75	0.75	0.75	0.75	0.75	0.75			Use AR&R or Table F3, pg F-6

Frequency Factors

FF, 1-year	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	Can use 0.8 for a construction site
FF, 2-year	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	Can use 0.85 for a construction
FF, 5-year	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	Can use 0.95 for a construction
FF, 10-year	1	1	1	1	1	1	1	1	Generally always 1
FF, 20-year	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	Can use 1.05 for a construction
FF, 50-year	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	Can use 1.15 for a construction
FF, 100-year	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	Can use 1.2 for a construction site

Flow Calculations									Notes
1-year, tc (m^3/s)	0.019	0.01	0.06	0.045	0.028				
2-year, tc (m^3/s)	0.041	0.021	0.129	0.098	0.061				
5-year, tc (m^3/s)	0.055	0.028	0.17	0.129	0.081				
10-year, tc (m^3/s)	0.067	0.034	0.209	0.159	0.099				
20-year, tc (m^3/s)	0.08	0.04	0.248	0.188	0.118				
50-year, tc (m^3/s)	0.101	0.051	0.314	0.238	0.149				
100-year, tc (m^3/s)	0.116	0.059	0.36	0.273	0.171				

NB for flow calculations on sediment basin spillways, see Worksheet 3 (if required).

3. Sediment Basin Spillway Design

Structure Details

Structure Name	C01	C02	C03	C04	C05	C06	Auto-filled from Worksheet 1
Catchment Area (ha)	0.859	0.528	4.865	1.009	1.973	0.883	Auto-filled from Worksheet 1
Time of concentration (tc)	7	6	14	8	10	8	Auto-calculated

Rainfall Intensities (IFD Values)

1 year, tc	38.6	38.6	38.6	38.6	38.6	38.6	Enter the relevant rainfall intensities (in mm/hr) for each of the nominated rainfall events. The time of concentration (tc) determines the duration of the event to be used
2 year, tc	78.4	78.4	78.4	78.4	78.4	78.4	
5 year, tc	92.7	92.7	92.7	92.7	92.7	92.7	
10 year, tc	108	108	108	108	108	108	
20 year, tc	122	122	122	122	122	122	
50 year, tc	141	141	141	141	141	141	
100 year, tc	155	155	155	155	155	155	
C_{10} runoff coefficient	0.37	0.37	0.37	0.37	0.37	0.37	Use AR&R or Table F3, pg F-6
Design ARI event (select):	10	10	10	10	10	10	Select design ARI (years) from dropdown
Frequency Factor	1	1	1	1	1	1	Auto-filled based on selected ARI
Flow Calculation	0.095	0.059	0.54	0.112	0.219	0.098	Auto-calculated based on selected ARI

4. Volume of Type C (Coarse) Sediment Basins

Type C Basin Design Criteria

Structure Name	C01	C02	C03	C04	C05	C06	Auto-filled from Worksheet 1
Catchment Area (ha)	0.859	0.528	4.865	1.009	1.973	0.883	Auto-filled from Worksheet 1
Sediment type (C, F or D)	C	C	C	C	C	C	Auto-filled from Worksheet 1
Design rainfall event	0.5	0.5	0.5	0.5	0.5	0.5	Choose design event from dropdown
Flow volume (m^3/s)	0.014	0.008	0.077	0.016	0.031	0.014	Calculated from IFD values above
Area Factor	4100	4100	4100	4100	4100	4100	Default is 4,100. See pg 6-12
Depth of settling (water zone) (m)	0.6	0.6	0.6	0.6	0.6	0.6	Minimum is 0.6m (pg 6-12)

Type C Basin Volume Calculations

Basin Surface Area (m^2)	57.4	32.8	315.7	65.6	127.1	57.4	Auto-calculated
Settling (water) zone volume (m^3)	34.4	19.7	189.4	39.4	76.3	34.4	Auto-calculated
Storage (soil) zone volume (m^3)	8.1	3	131.8	91.8	167.3	72.3	Auto-calculated
Total basin volume (m^3)	42.5	22.7	321.2	131.2	243.6	106.7	Auto-calculated

Basin Shape

Enter length:width ratio	3	3	3	3	3	3	E.g. for 3:1 (L:W) enter 3.
Length (m)	13.1	9.9	30.8	14	19.5	13.1	These figures should be taken as a guide only. Detailed calcs might be required.
Width (m)	4.4	3.3	10.3	4.7	6.5	4.4	

3. Sediment Basin Spillway Design

Structure Details

Structure Name	C07	C08	C09	C10	C11	C12	Auto-filled from Worksheet 1
Catchment Area (ha)	3.969	1.723	0.907	8.376	1.234	1.453	Auto-filled from Worksheet 1
Time of concentration (tc)	13	10	8	18	9	9	Auto-calculated

Rainfall Intensities (IFD Values)

1 year, tc	38.6	38.6	38.6	38.6	38.6	38.6	Enter the relevant rainfall intensities (in mm/hr) for each of the nominated rainfall events. The time of concentration (tc) determines the duration of the event to be used
2 year, tc	78.4	78.4	78.4	78.4	78.4	78.4	
5 year, tc	92.7	92.7	92.7	92.7	92.7	92.7	
10 year, tc	108	108	108	108	108	108	
20 year, tc	122	122	122	122	122	122	
50 year, tc	141	141	141	141	141	141	
100 year, tc	155	155	155	155	155	155	

C_{10} runoff coefficient	0.37	0.37	0.37	0.37	0.37	0.37	Use AR&R or Table F3, pg F-6
Design ARI event (select):	10	10	10	10	10	10	Select design ARI (years) from dropdown
Frequency Factor	1	1	1	1	1	1	Auto-filled based on selected ARI
Flow Calculation	0.441	0.191	0.101	0.93	0.137	0.161	Auto-calculated based on selected ARI

4. Volume of Type C (Coarse) Sediment Basins

Type C Basin Design Criteria

Structure Name	C07	C08	C09	C10	C11	C12	Auto-filled from Worksheet 1
Catchment Area (ha)	3.969	1.723	0.907	8.376	1.234	1.453	Auto-filled from Worksheet 1
Sediment type (C, F or D)	C	C	C	C	C	C	Auto-filled from Worksheet 1
Design rainfall event	0.5	0.5	0.5	0.5	0.5	0.5	Choose design event from dropdown
Flow volume (m^3/s)	0.063	0.027	0.014	0.133	0.02	0.023	Calculated from IFD values above
Area Factor	4100	4100	4100	4100	4100	4100	Default is 4,100. See pg 6-12
Depth of settling (water zone) (m)	0.6	0.6	0.6	0.6	0.6	0.6	Minimum is 0.6m (pg 6-12)

Type C Basin Volume Calculations

Basin Surface Area (m^2)	258.3	110.7	57.4	545.3	82	94.3	Auto-calculated
Settling (water) zone volume (m^3)	155	66.4	34.4	327.2	49.2	56.6	Auto-calculated
Storage (soil) zone volume (m^3)	245.3	51.7	156	275.4	102.5	136.6	Auto-calculated
Total basin volume (m^3)	400.3	118.1	190.4	602.6	151.7	193.2	Auto-calculated

Basin Shape

Enter length:width ratio	3	3	3	3	3	3	E.g. for 3:1 (L:W) enter 3.
Length (m)	27.8	18.2	13.1	40.4	15.7	16.8	These figures should be taken as a guide only. Detailed calcs might be required.
Width (m)	9.3	6.1	4.4	13.5	5.2	5.6	

3. Sediment Basin Spillway Design

Structure Details

Structure Name	D1	D2	D3	D4	D5		Auto-filled from Worksheet 1
Catchment Area (ha)	0.298	0.151	0.928	0.705	0.441		Auto-filled from Worksheet 1
Time of concentration (tc)	5	4	8	7	6		Auto-calculated

Rainfall Intensities (IFD Values)

1 year, tc	38.6	38.6	38.6	38.6	38.6		Enter the relevant rainfall intensities (in mm/hr) for each of the nominated rainfall events. The time of concentration (tc) determines the duration of the event to be used
2 year, tc	78.4	78.4	78.4	78.4	78.4		
5 year, tc	92.7	92.7	92.7	92.7	92.7		
10 year, tc	108	108	108	108	108		
20 year, tc	122	122	122	122	122		
50 year, tc	141	141	141	141	141		
100 year, tc	155	155	155	155	155		

C_{10} runoff coefficient	0.37	0.37	0.37	0.37	0.37		Use AR&R or Table F3, pg F-6
Design ARI event (select):	10	10	10	10	10		Select design ARI (years) from dropdown
Frequency Factor	1	1	1	1	1	#N/A	Auto-filled based on selected ARI
Flow Calculation	0.033	0.017	0.103	0.078	0.049	#N/A	Auto-calculated based on selected ARI

4. Volume of Type C (Coarse) Sediment Basins

Type C Basin Design Criteria

Structure Name	D1	D2	D3	D4	D5		Auto-filled from Worksheet 1
Catchment Area (ha)	0.298	0.151	0.928	0.705	0.441		Auto-filled from Worksheet 1
Sediment type (C, F or D)	C	C	C	C	C		Auto-filled from Worksheet 1
Design rainfall event	0.5	0.5	0.5	0.5	0.5		Choose design event from dropdown
Flow volume (m^3/s)	0.005	0.002	0.015	0.011	0.007		Calculated from IFD values above
Area Factor	4100	4100	4100	4100	4100		Default is 4,100. See pg 6-12
Depth of settling (water zone) (m)	0.6	0.6	0.6	0.6	0.6		Minimum is 0.6m (pg 6-12)

Type C Basin Volume Calculations

Basin Surface Area (m^2)	20.5	8.2	61.5	45.1	28.7	Not Type C	Auto-calculated
Settling (water) zone volume (m^3)	12.3	4.9	36.9	27.1	17.2	Not Type C	Auto-calculated
Storage (soil) zone volume (m^3)	18.4	20.8	176.6	90.7	10.7	Not Type C	Auto-calculated
Total basin volume (m^3)	30.7	25.7	213.5	117.8	27.9	Not Type C	Auto-calculated

Basin Shape

Enter length:width ratio	3	3	3	3	3		E.g. for 3:1 (L:W) enter 3.
Length (m)	7.8	5	13.6	11.6	9.3	N/A	These figures should be taken as a guide only. Detailed calcs might be required.
Width (m)	2.6	1.7	4.5	3.9	3.1	N/A	

Stantec

Stantec is a global leader in sustainable engineering, architecture, and environmental consulting. The diverse perspectives of our partners and interested parties drive us to think beyond what's previously been done on critical issues like climate change, digital transformation, and future-proofing our cities and infrastructure. We innovate at the intersection of community, creativity, and client relationships to advance communities everywhere, so that together we can redefine what's possible.

Stantec Australia Pty Ltd
Ground Floor, 16 Burelli Street
Wollongong NSW 2500
AUSTRALIA
ABN 17 007 820 322
stantec.com